

Environmentally Compliant Coating Remover Evaluation



ASSETS Defense 2012

August 30, 2012



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Outline

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- Project Team
- Background
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- Technical Approach
- Laboratory Test Scope
- Laboratory Test Results
- Remaining Tasks
- Questions

Project Overview

- POP: 19 APR 2011 to 18 OCT 2012
- Award: \$226,419 (includes \$16,025 as fee)
- Project Team:
 - DSCR POC – Mr. Calvin Lee, HazMin Green Products Branch
 - USAF POC – Mr. Jeff Kingsley, AFRL/RXSA
 - Battelle Team
 - Project Manager – Annie Lane
 - Principal Investigator – John Stropki
 - Stakeholder Team
 - Ms. Diane Kleinschmidt, NAVAIR
 - Ms. Louise Nguyen, OC-ALC
 - David Ellicks, AFCPCO
 - Mr. Charles McKenna, AFCPCO-SKT (On-site Support Contractor)



Hazardous Min/Green Products Branch Approach

Green Products Office

Supporting the Enterprise:

- Help define the customers' green needs
- Identify green products
- Assist in determining suitability of items
- Support cataloging process

Developing productive relationships with customers' organizations

*Liaison
with customers
Is key!*

DLA Customers

Continuous customer liaison

- Navy: NAVAIR, NAVSEA
- Air Force: ALCs
- Army: TACOM, AMC, AEC

DSCR offers a new, website where customers ask questions, get support, or just suggest improvements.

Supply Support Requests sent to DLA

Vendors

DSCR will engage vendors in an effort to find the products our customers need

- Supplier Conferences
- Industry Publications
- Trade Associations

Vendors work with the services to identify Green products that warrant Stock Numbers

**Customers order
more green items**

Accomplishments and Results

Biobased Product Item Category	Number of Products Evaluated	Number of Manufacturers Participating
Hydraulic Fluids	80	19
Diesel Fuel Additives	11	7
Penetrating Lubricants	16	10
Metalworking Fluids	62	8
Sorbents	72	17
Adhesive and Mastic Removers	25	19
Greases	18	5
Glass Cleaners	11	11
Firearm Lubricants	8	2
Chain, Cable, and Gear Lubricants	33	13
Corrosion Preventatives	19	10
Industrial and Multipurpose Cleaners	114	40
Parts Wash Solutions	22	9

Total of 491 products evaluated

Background

- Many DoD depainting operations currently use environmentally compliant peroxide-assisted benzyl alcohol strippers
 - These strippers have acceptable coating removal rates with minimal physical damage to metallic substrates
- However, several major drawbacks exist, including:
 - Limited effectiveness on coating stack-ups containing new non-Cr pretreatments
 - Potential for damage to resins used in structural composites

Project Objectives

- Conduct an unbiased evaluation of an alternative, environmentally friendly chemical coating remover
- Support implementation of the product by stakeholders at Air Force, Navy and other DoD depainting operations
 1. Identify and evaluate applications in AF and Navy depots for alternative coating removers
 2. Capture end user technical interest and acceptance of compliant coating remover
 3. Support validation and transition of alternative remover to AF and Navy depainting operations

Technical Approach

- A two phased approach is recommended to support evaluation and possible implementation of the alternative coating remover at AF and Navy depots
 - **Phase I:** Conduct laboratory testing to comparatively assess the performance of the alternative coating remover against existing chemical removers in use at AF and Navy depots
 - **Phase II:** Perform demonstration/validation testing on coated military assets to facilitate stakeholder “buy-in” and incorporation of the alternative remover into AF Technical Orders and Navy Technical Manuals

Remover Candidate Selection

- Polygone 310-AG, RPM Technology
 - Identified under ESTCP Project WP-0621 completed by AFRL, NAVAIR and Battelle to evaluate aircraft sealant removers
 - Environmentally friendly product
 - Passed corrosion testing requirements for sandwich corrosion, hydrogen embrittlement and total immersion corrosion
- Desolift 5269, PPG Aerospace Coatings
 - Environmentally compliant benzyl alcohol product
 - Passed corrosion testing conducted by SMI in 2011



Laboratory Testing Scope

- Identified laboratory testing requirements from review of AF and Navy documents and survey of stakeholders
- Test plan focused on two efforts:
 1. Evaluation of removers against corrosion requirements
 2. Comparative evaluation of stripping efficiency
- Coating remover test matrix
 - **Polygone 310AG**, RPM Technology
 - **Desolift 5269**, PPG
 - Turco 6813E, Henkel
 - DePaint XP, Aerochem, Inc.
 - Plane Naked, Aerochem, Inc
 - DeKote AF, Aerochem, Inc

Laboratory Testing – SMI Results

Test	Polygone 310-AG	Desolift 5269
Immersion Corrosion	Passed	Failed ¹
Dissimilar Metal Corrosion	Passed	Passed
Residue Corrosion	Passed	Passed
Sandwich Corrosion	Passed	Passed
Hydrogen Embrittlement	Failed ²	Passed

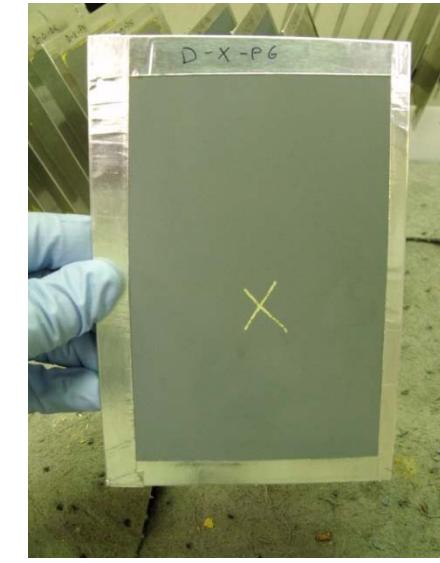
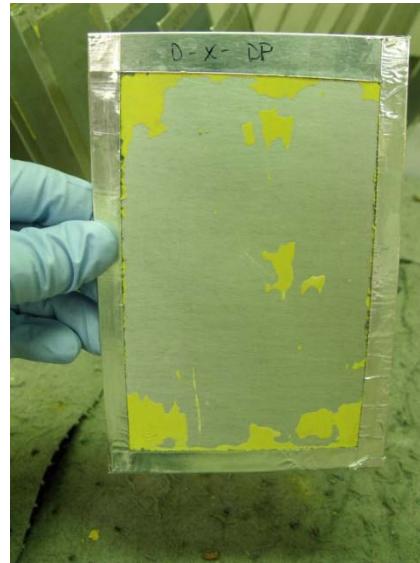
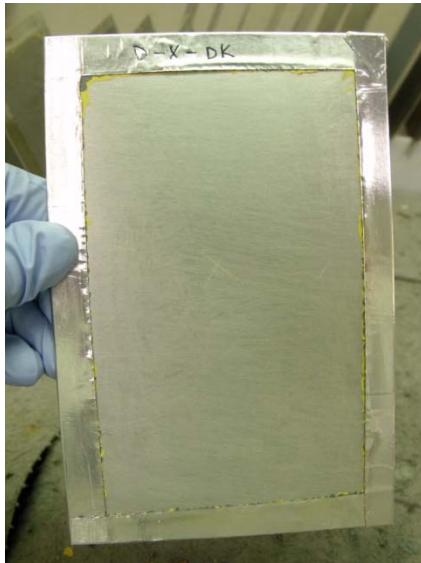
1. Passed requirement (except for Mg panels) in testing conducted by SMI in 2011; Also passed in follow-up testing conducted by Battelle on steel panels
2. Passed requirement in testing conducted by NAVAIR in 2010; verification testing underway with independent laboratory

Laboratory Testing – Test Panel Prep

Substrate	Code	Coating System	
2024 Aluminum	A	Pretreatment	MIL-C-81706 Chromate CC
		Primer	MIL-PRF-23377J, Type 1, Class C
		Topcoat	MIL-PRF-85285, Type IV, Class H
	B	Pretreatment	MIL-C-81706 Chromate CC
		Primer	TT-P-2760, Type 1, Class C
		Topcoat	MIL-PRF-85285, Type IV, Class H
	C	Pretreatment	MIL-C-81706 Chromate CC
		Primer	MIL-PRF-85582, Type I, Class C1
		Topcoat	MIL-PRF-85285, Type IV, Class H
	D	Pretreatment	PreKote Pretreatment
		Primer	MIL-PRF-23377J, Type I, Class C
		Topcoat	MIL-PRF-85285, Type IV, Class H
	E	Pretreatment	PreKote Pretreatment
		Primer	PR-1432-GV, then MIL-PRF-23377J, Type I, Class C
		Topcoat	MIL-PRF-85285, Type IV, Class H

Laboratory Test Results – Unaged Panels

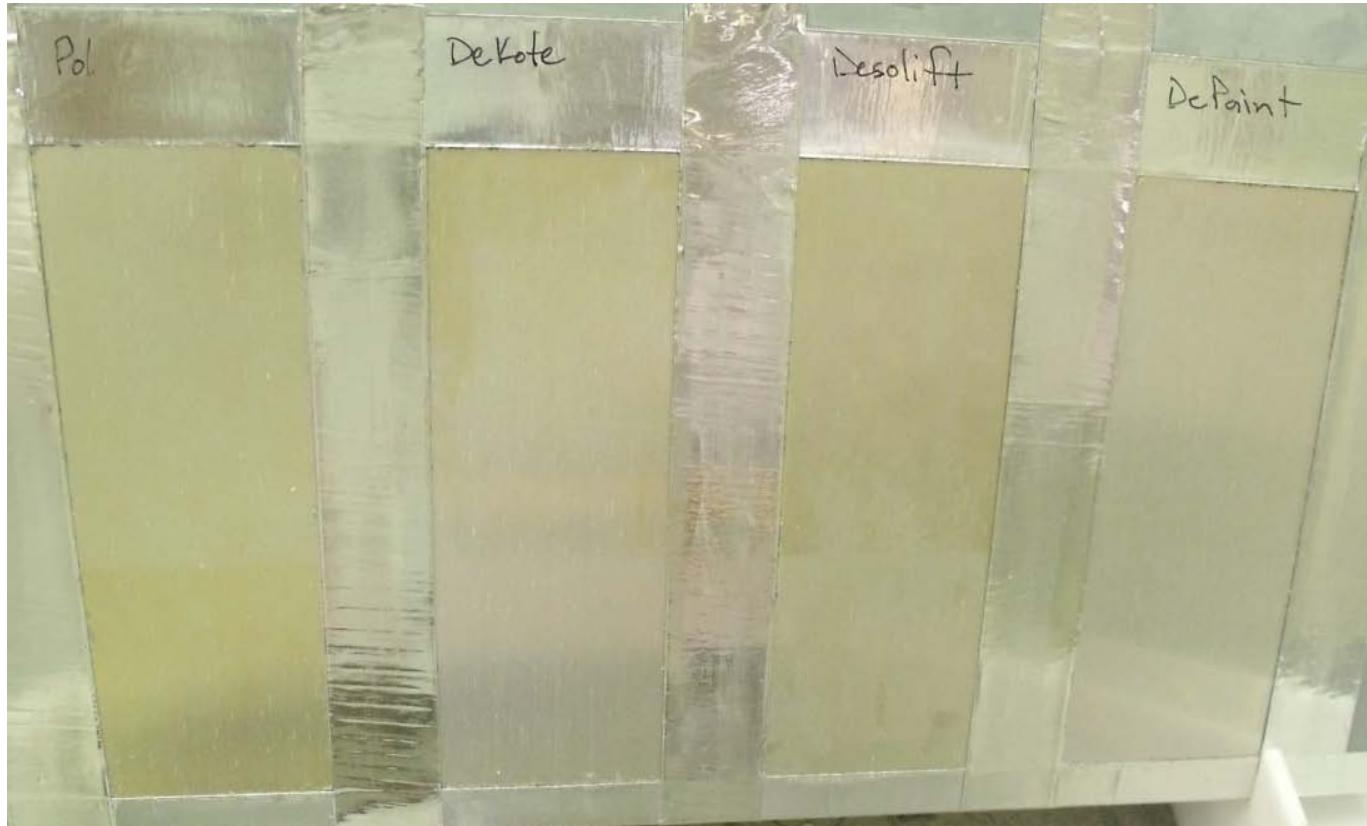
- Stripping performance on unaged panels was not ideal
 - Best performers still required 24 hour dwell for complete removal
 - Performance was reduced on coating systems with PreKote



24 hour stripping results on panels with PreKote pretreatment, 23377 primer and APC topcoat. Strippers, from the left, are DeKote, DePaint XP, Desolift 5269 and PolyGone 310 AG Gel.

Laboratory Test Results – Aged Panels

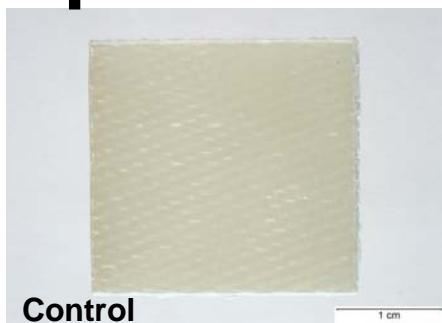
- Stripping performance was improved on aged panels
 - DeKote, DePaint and Desolift products performed best overall



Composite Panel Degradation Testing

- Fiberglass and graphite epoxy coupons were treated with the removers and inspected following a 24 hour dwell time
- Clear signs of fiberglass resin depletion were observed with use of the following removers:
 - DePaint XP, DeKote and Plane Naked
 - No evidence of fiberglass resin depletion was observed for the remaining removers
- There was no evidence of depletion on the graphite epoxy panels for any of the removers

Composite Panel Inspection Results



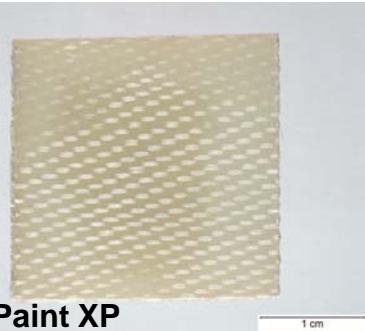
Control



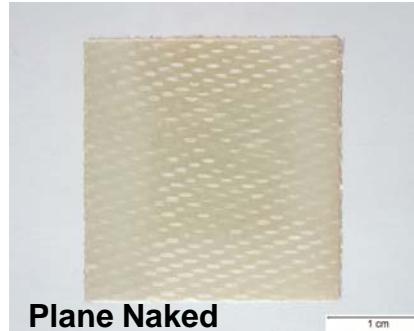
DeKote



Desolift 5269



DePaint XP



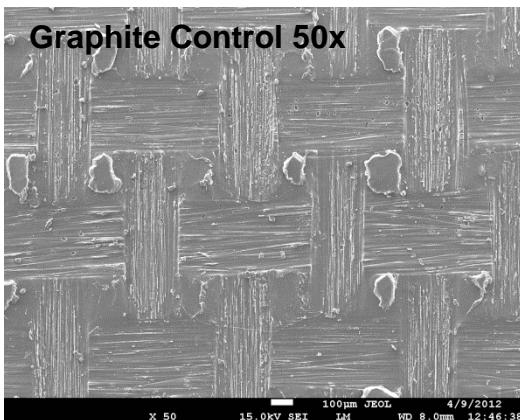
Plane Naked



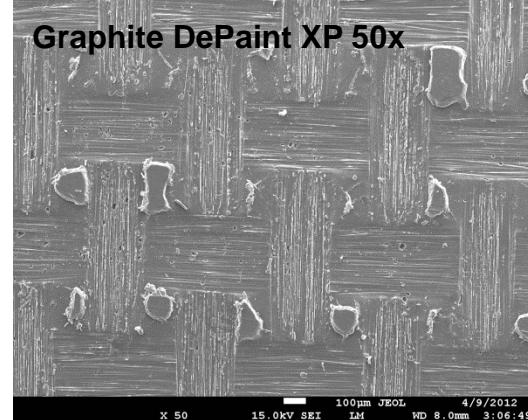
PolyGone 310 AG Gel



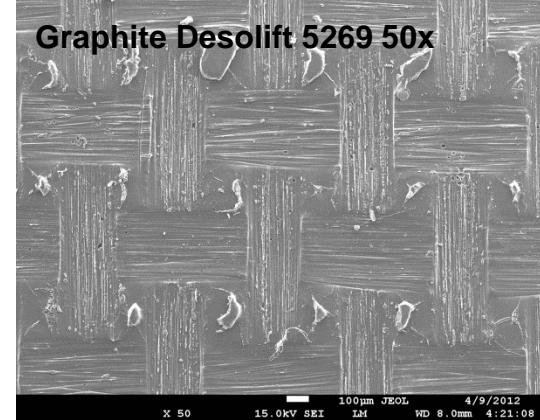
Turco 6813E



Graphite Control 50x



Graphite DePaint XP 50x



Graphite Desolift 5269 50x

Phase II Remaining Tasks

- Task 4: Field Testing
 - Perform field demonstration/validation testing at an AF depot and Navy Fleet Readiness Center to support product use and potential implementation
 - Conduct comparative testing on off-aircraft component parts and aircraft structures
- Task 5: Results Documentation
 - Summarize program results in a final report
- Task 6: Technology Transition
 - Support process owners in updating technical documents such as T.O. 1-1-8 and applicable Navy Technical Manuals
 - Establish NSNs for alternative removers

Battelle

The Business of Innovation.

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